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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,591	03/29/2004	Donghul Lu	42P19023	2696

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EXAMINER	
STOUFFER, KELLY M	
ART UNIT	**PAPER NUMBER**
1762	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/08/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/811,591	LU, DONGHUL	
	Examiner	Art Unit	
	Kelly Stouffer	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) *12-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 February 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-11 in the reply filed on 5 February 2007 is acknowledged. The traversal is on the ground(s) that the amendments to claims 12-18 overcome the restriction requirement. This is not found persuasive because the two groups still represent divergent subject matter. They would require separate search and have a different status in the art. The invention of group II, claims 12-18, may be made by another and materially different process as depositing a nitride layer on a surface does not require one to use plasma for the deposition. (See MPEP 806.05 f-g) Claims 12-18 remain withdrawn from consideration.

The requirement is still deemed proper and is therefore made FINAL.

Response to Arguments

2. Applicant's arguments, filed 5 February 2007, with respect to the drawings and specification have been fully considered and are persuasive. The objections of the drawings and specification have been withdrawn.

3. Applicant's arguments, filed 5 February 2007, with respect to the 35 USC 112 2nd paragraph rejections of claims 8-11 have been fully considered and are persuasive. The 35 USC 112 2nd paragraph rejections of claims 8-11 have been withdrawn.

4. The remainder of the applicant's arguments filed 5 February 2007 have been fully considered but they are not persuasive. The applicant argues that line 1 of page 10 of the specification "moving equipment that was acting on the wafer" is sufficient to overcome the 35 USC 112 1st paragraph enablement rejection of claim 9. The breadth of claim 9, citing moving two fixtures relative to the substrate, is more specific that the disclosure. The nature of the invention is a coating process and does not include extensive apparatus information. The state of the prior art is such that moving a fixture, such as a showerhead, relative to a substrate is not common and how one would accomplish moving said fixture is not predictable based upon prior art, nor would it be predictable to one of ordinary skill in the art at a graduate level. The applicant only provides "moving equipment that was acting on the wafer" as the amount of direction for the limitations in claim 9, and does not provide working examples of this limitation. One of ordinary skill in the art would therefore have to undergo an undue amount of experimentation to make or use the invention based upon the content of the disclosure. Therefore, the 35 USC 112 1st paragraph enablement rejection is maintained, and repeated here.

The applicant argues that Maes in view of Nguyen does not teach all of the elements of independent claim 1, more specifically, introducing a deposition gas after applying plasma power. However, in the passage cited in the previous office action – column 5 lines 22-43 of Maes – Maes discloses that the silicon source gas may be pulsed into a continuous flow of nitrogen radicals. This reads on the claim limitation of introducing a deposition gas (silicon) after applying plasma power. The flow of radicals,

or plasma, is continuous in Maes in column 5 lines 40-43. Nitrogen radicals provided to the chamber (column 5 lines 25-30) read on the limitation of applying plasma power to a PESCVD chamber, at least as broadly as it is recited in the claims. Therefore, the 35 USC 103 (a) rejections of the claims are maintained and repeated here.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 9 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. It is uncertain how one of ordinary skill in the art would be able to move nitrogen fixtures relative to the substrate as it is written in claim 9. The breadth of claim 9, citing moving two fixtures relative to the substrate, is more specific that the disclosure. The nature of the invention is a coating process and does not include extensive apparatus information. The state of the prior art is such that moving a fixture, such as a showerhead, relative to a substrate is not common and how one would accomplish moving said fixture is not predictable based upon prior art, nor would it be predictable to

one of ordinary skill in the art at a graduate level. The applicant only provides "moving equipment that was acting on the wafer" as the amount of direction for the limitations in claim 9, and does not provide working examples of this limitation. One of ordinary skill in the art would therefore have to undergo an undue amount of experimentation to make or use the invention based upon the content of the disclosure.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-8 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 6818517 to Maes in view of US Patent publication 2004015845 to Nguyen et al.

Regarding claims 1 and 2, Maes discloses applying plasma power to form a film by generating plasma and flowing a deposition gas during the plasma deposition simultaneously or in pulses. The nitride is deposited and the plasma power is shut off. (Column 5 lines 22-43) Maes does not include this layer as part of a first portion of a layer then repeating this process to form a second layer. Nguyen et al. teaches depositing a first portion of a layer then repeating the process to form a second layer (abstract, Figure 4 and paragraph 0049) during a process that offers advantages over the method of Maes including lower temperature reactions for modern semiconductor processing (paragraph 0004), to deposit films of high coverage on a not-flat substrate such as vias or trenches in semiconductors (paragraph 0010), minimize process time and enhance film quality (paragraph 0049).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Maes to include the nitride layer as part of a first portion of a layer then repeating this process to form a second layer as taught by Nguyen et al. in order to take advantage of lower temperature reactions for modern semiconductor processing, to deposit films of high coverage on a not-flat substrate such as vias or trenches in semiconductors, minimize process time and enhance film quality.

Regarding claim 3, Maes uses silane as a deposition gas in column 5 line 31.

Regarding claim 4, Maes discloses that silane may be pulsed during the nitrogen plasma deposition. One of ordinary skill in the art would recognize the capability of the first pulse or any pulse thereafter occurring at least more than 0.5 seconds after applying the plasma.

Regarding claim 5, Maes includes by reference in entirety US patent 6544900 to Raaijmakers et al. that includes the silane gas flowing through process chamber 12 in Figure 2 before being removed by a vacuum pump.

Regarding claims 6 and 7, Maes discloses using nitrogen and ammonia as plasma gases in column 5 lines 23-46. In addition, one of ordinary skill in the art would recognize that a plasma of nitrogen as disclosed by Maes would not be possible without initiating a gas flow to start the plasma.

Regarding claims 8 and 11, Nguyen et al. discloses purging after each step of depositing parts of the film and depositing parts of the film until the desired thickness, or complete film, is reached, in Figure 4.

Regarding claim 10, Raaijmakers et al. includes a chamber that is equipped to process many substrates (Figure 1) that would include the capability of moving the substrates in between processing steps.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER